



Reconstructing extensive Alpine glaciations from the stratigraphy of overdeepened glacial basins

Marius W. Buechi, Lukas Gegg, and Flavio S. Anselmetti

University of Bern, Institute of Geological Sciences & Oeschger Centre for Climate and Climate Change Research, Bern, Switzerland

Timing, extent, and paleoclimatic conditions of extensive Middle and Late Pleistocene glaciations in mid-latitude mountain ranges such as the Alps remain poorly constrained due to of the often-fragmentary character of terrestrial Quaternary archives. In this context, the highly underexplored sedimentary infill of subglacial basins serve as important records to complement the Quaternary stratigraphy over several glacial-interglacial cycles so that they allow a better understanding of the climatic controls and the geomorphic processes of these glaciations.

We present results from the overdeepened Glatt valley, northern Switzerland, where dense subsurface data revealed i.) two main subparallel overdeepened bedrock troughs (incised up to 200 m below the modern valley floor), and ii.) several “inlaid” basins that are nested within the Quaternary valley fill. The stratigraphy of these glacial basin is likely to result from a multiphase erosion and infilling history related to the repeated advance and retreat of Alpine glaciers in the Northern Alpine foreland. These glaciations can be related to the global MIS2, MIS6, and up to three earlier Middle Pleistocene glaciation periods using age constraints from OSL-dating of the infill and from regional correlations.

The arrangement of subglacial basins with sub-parallel bedrock troughs, re-excavated segments, and inlaid basins along with the preservation of “older” sediments document changes in the magnitude and the spatial focus of subglacial erosion over time. Therefore, the findings from the Glatt valley are particularly important to better understand i.) when and how glaciers form overdeepened basins and ii.) how the complex stratigraphic architecture of glacial basins can be successfully used as archives of glaciation history. Ongoing and planned deep drilling projects into major overdeepened basin systems in the Alps will help to further consolidate the terrestrial Quaternary record of this mountain range.